

April 15, 2004

TO: G. Burke

FROM: A. Andujo

SUBJECT: New Horizons Modified Requirements Loading Study

This study is in response to a mission request from R. Benson. The purpose of this study is to evaluate the DSN's ability to support the New Horizons mission with modified requirements.

Analysis was accomplished using the FASTER (Forecasting and Scheduling Tool for Earth-based Resources) forecasting system, TIGRAS (TMOD Integrated Ground Resource Allocation System) scheduling tool and the updated mission set database from the February 2004 Resource Allocation Review Board (RARB). Only antenna time conflicts were considered, not hardware conflicts.

Introduction

The purpose of this study is to evaluate the DSN's ability to support an alternate support scenario for New Horizons, in which requirements are modified. The scenario discussed changes all Beacon support to Cruise support. Approximately one 40-minute pass per week to one 8-hour pass per week. Beacon support at the 34BWG1 subnet begins in week 17 of 2007 and continues through week 52 of 2011, and at the 70M subnet Beacon support begins in week 01 of 2012 and continues through week 42 of 2014. The subnets remain unchanged in the modified scenario, only support time is changed.

Overall Results

The requirements and trajectory of the New Horizons mission allow the spacecraft to be supported with minimal impact to DSN resources. This study shows that a more than 800% increase in the mission's support hours during the Beacon phases, the DSN is still able to provide the mission with very nearly 100% supportable time. The New Horizons view period and the requirement of up to one 8-hour pass per day will allow it to attain its support with little or no impact to other missions and DSN maintenance. According to the results of this study, New Horizons can expect to maintain requirement even under the heaviest contention periods. In the scenarios discussed in this study the New Horizons mission made little or in most cases no impact to other missions. In no way is any other mission or activity detrimentally affected.

It should be noted that the time period discussed is so advanced that subnet loading will change dramatically by the time they are reached with new missions and ever changing mission requirements. It should also be noted that there are several Mars missions being planned for launch in 2007, 2009, 2011, 2013 and beyond, which depending on activities and budgets may severely impact the entire network. Even missions with smaller requirements, such as New Horizons may see some losses in supportable time.

Recommendations

It is our recommendation that the New Horizons mission adjust the current ULP if necessary, but also consider the use of alternate support assets to complement the 34BWG1 and 70M subnets to increase flexibility in scheduling. We also recommend that a full loading study be performed prior to launch to assess overall supportability.

Assumptions

- Although the mission begins in week 2 of 2006 through week 15 2016, this study only focuses on the period containing Beacon support, week 17 of 2007 through week 42 of 2014.
- Amount of supports per week remains unchanged.
- Subnets used remain unchanged, 34B1 in 2007-2011 and 70M in 2012-2014.
- A 60 minute setup and 15 minute teardown is maintained.
- All other support remains unchanged, (i.e. DDOR, maneuver support)

Assessment of New Horizons Supportability 2007 - 2014:

Increases in unsupportable time percentages average 1.83% for the mission on the 34BWG1 subnet to 1.14% on the 70M subnet throughout the entire period. New Horizons' trajectory allows it to maintain a relatively long and constant view from Earth approximately 29 hours per day. This long and consistent viewperiod allows the mission great flexibility in scheduling support time, which along with the minimal requirements (even up to 8 hours per day) explains the high supportable time figures seen in Figures 1 and 2. The mission should be fully supportable with the increased support time.

Assessment of the 34BWG1 subnet 2007 - 2011:

Figure 3 indicates that increasing New Horizons' support requirements will increase unsupportable time percentages for the 34BWG1 subnet on average by 0.16%, but in most cases this increase reduces unsupportable time percentages by up to 0.14%. This reduction is attributed to the fact that increases to requested time on the subnet, without an increase to subnet unsupportable time reduces the unsupportable time percentage overall. Overall the subnet suffers very little unsupportable time from the increase in requirements.

Assessment of the 70M subnet 2012 - 2014:

Figure 4 indicates that that the requirements change from Beacon to Cruise support is fully supportable by the subnet. There is also little, and in most cases no impact to the subnet and its users. On average the change reduces supportable time on the subnet by 0.00017%, overall the subnet is forecasted to support over 94.5% of requested time. In most months unsupportable time is reduced by as much as 0.17% as seen on the 34BWG1 subnet.

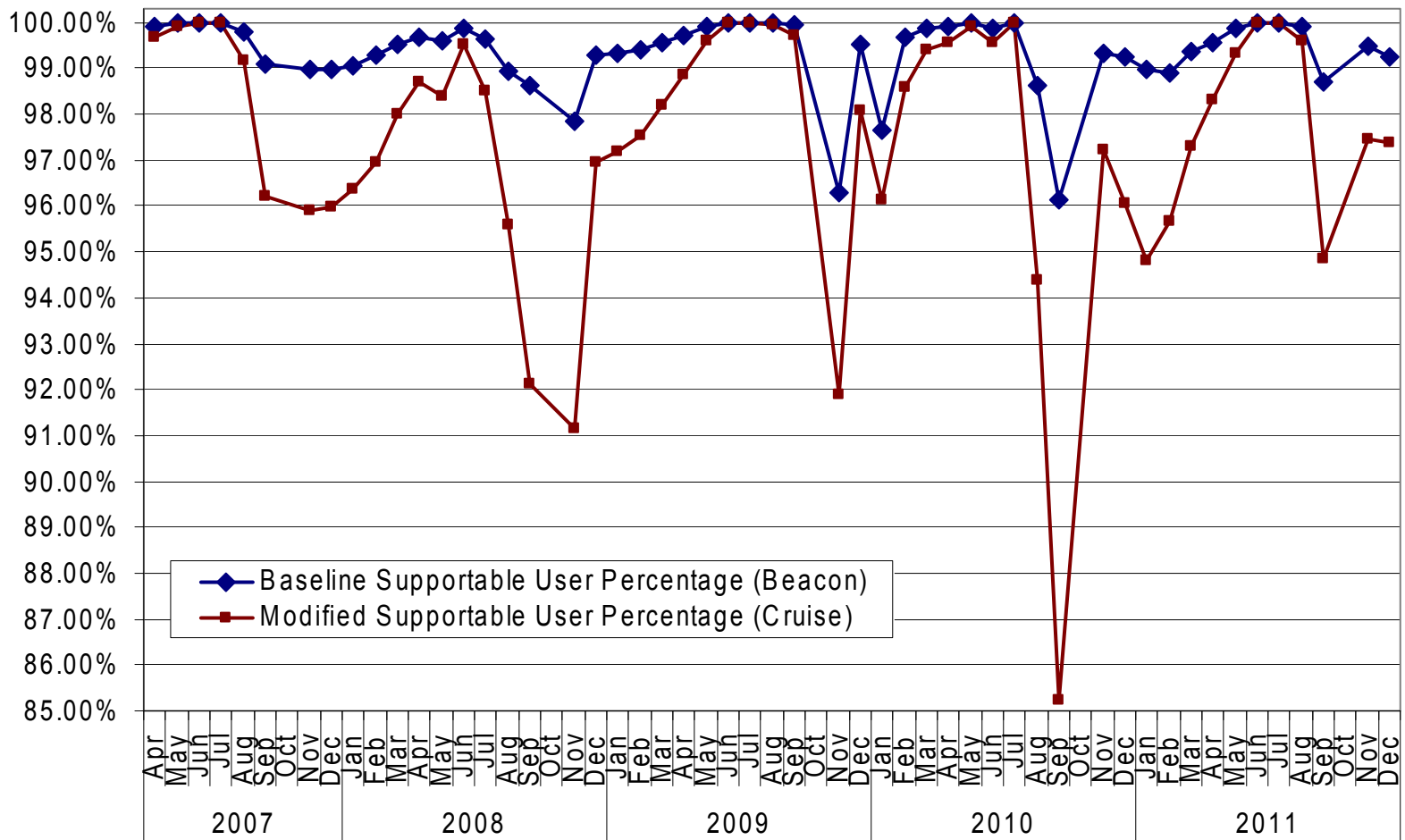
Summary of Results

Overall, the increase of support requirements for New Horizons may increase unsupportable time, but in most months unsupportable time is decreased, fully maintaining supportability for New Horizons. The 34BWG1 and 70M subnets showed little change in supportability. The results of this study also show that no other missions are affected by this increase in support.

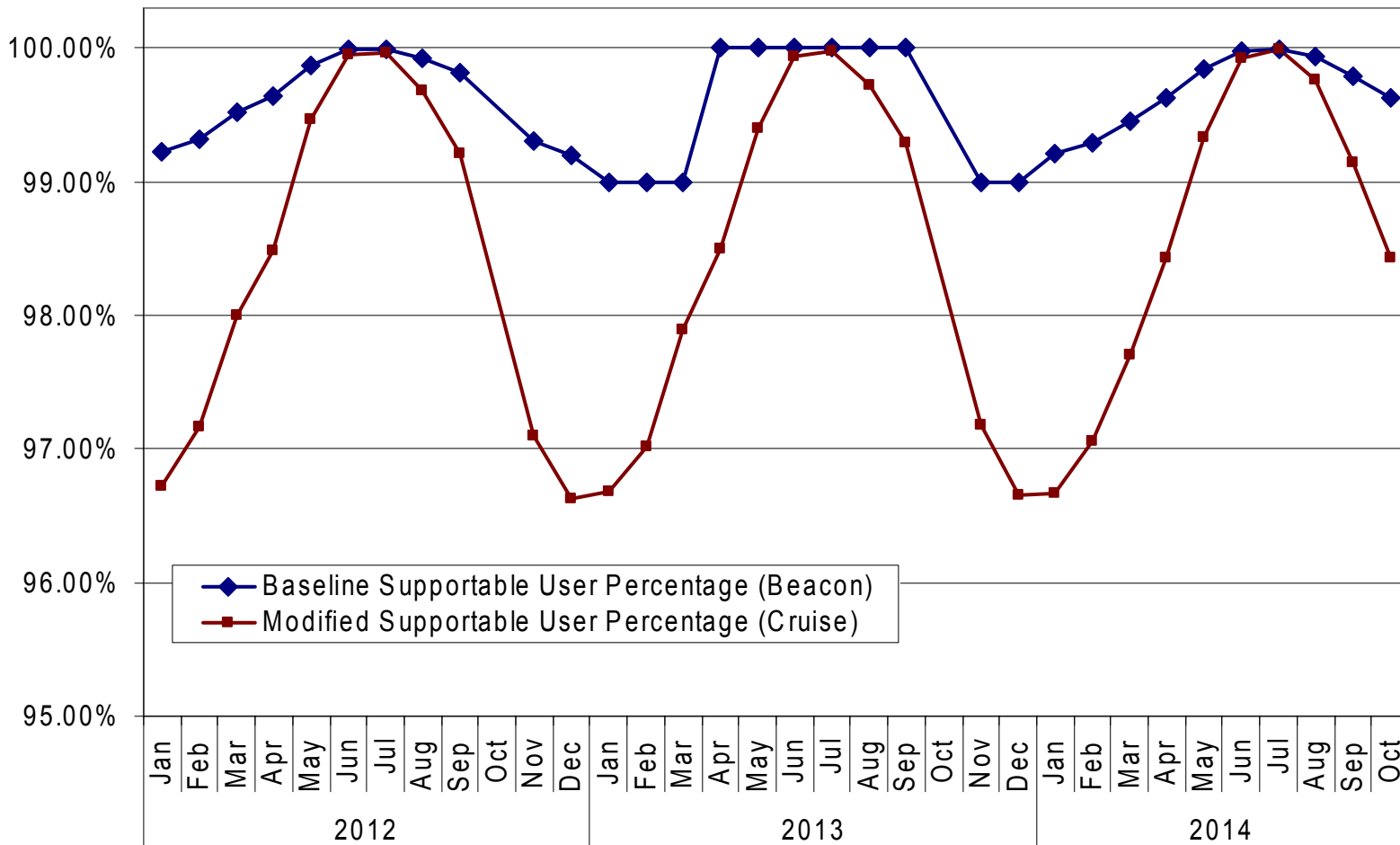
Conclusion

Changing Beacon support to Cruise support for New Horizons is fully supportable at this time.

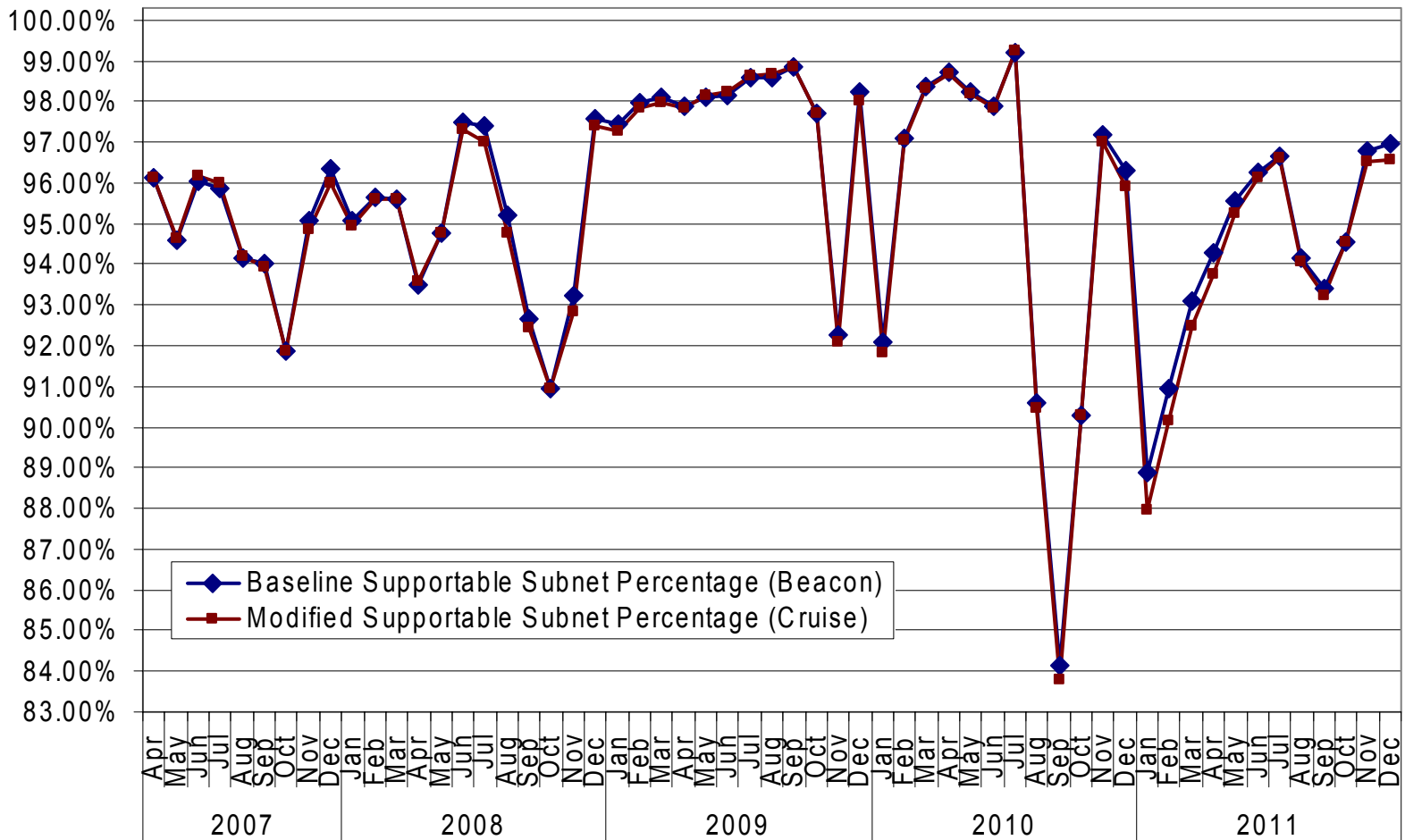
**Figure 1. New Horizons Supportable Time Percentage at the 34BWG1 Subnet
Beacon vs. Cruise Support 2007 - 2011**



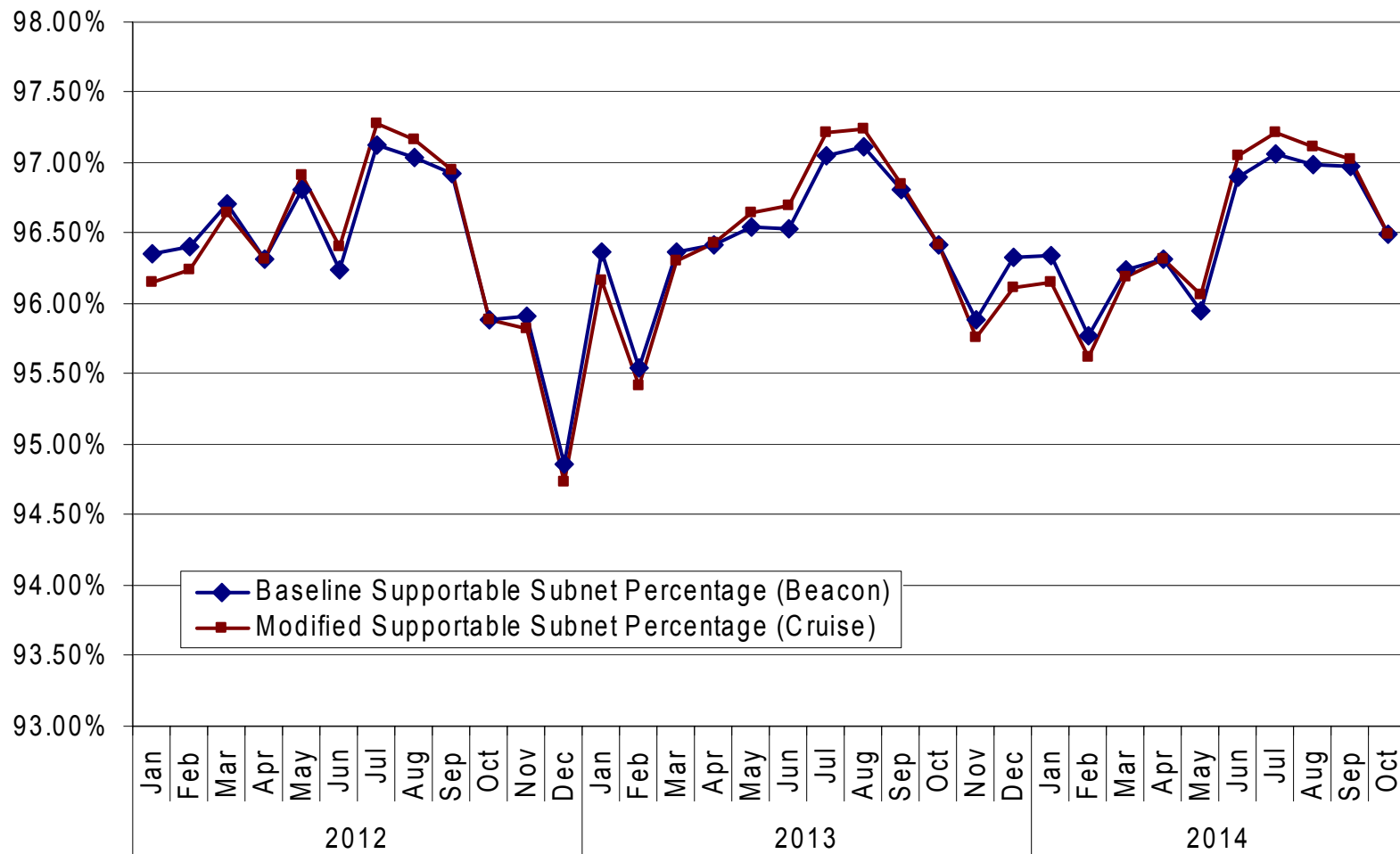
**Figure 2. New Horizons Supportable Time Percentage at the 70M Subnet
Beacon vs. Cruise Support 2012 - 2014**



**Figure 3. 34BWG1 Subnet Supportable Time Percentage
with New Horizons Beacon vs. Cruise Support 2007 - 2011**



**Figure 4. 70M Subnet Supportable Time Percentage
with New Horizons Beacon vs. Cruise Support 2012 - 2014**



As always, the results of this study are subject to change. Network loading changes as mission requirements are updated and periods of antenna downtime are identified. We will continue to work with New Horizons and other users of the DSN to maximize the time available for each individual user.

cc:

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